User's Manual
PLC09 Arbitrator Unit
Allen-Bradley PLC[1] Interface

Calta Computer Systems Limited
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1.0 Introduction

The Allen-Bradley Interface Unit is equipped with four serial asynchronous ports. It is designed to connect between the RS-232 serial ports of three host computers and an Allen-Bradley PLC. The Interface Unit's software allows access to the controller on a round robin basis. If one host is currently accessing the controller and a request is received from another other host, its request is queued until the initial host's interrogation and subsequent PLC response is complete. The unit is equipped with battery backed up RAM which holds the configurable parameters.

1.1 Features

Power Up Check	Upon power up, the unit checks EPROM and RAM memory for validity. If a fault occurs, the LED on the front of the unit will blink once every 1.5 seconds for an EPROM problem, twice every 2.0 seconds for a RAM problem, and three times every 2.5 seconds if the default configuration has been restored. If there are no errors, the LED is on steady if characters are not being output to a PLC (or as configured). If the LED is out, and the unit is not in configuration mode, the unit is faulty.
Message Detection	The unit monitors messages to determine the start and end of requests.
Protocols	The unit can be configured to communicate with a PLC in Full or Half Duplex.
Output Indication	If the power up checks indicate that RAM and EPROM are fine, the LED on the front panel goes on steady. However, the front LED can be configured to indicate output is currently in progress via one of the ports. A parameter is available to select which port output to monitor using the LED.
Modem RTS	Host 1 port and the PLC port can control RTS for a 202 type modem or radio in order to turn carrier on and off.

2.0 Installation

2.1 General

The rear of the Allen-Bradley Interface Unit contains four female connectors, a male connector, and a pushbutton switch. The first connector (a mini phono jack) on the left is for power (9 to 15 volts D.C.). Next is the pushbutton used for initiating the configuration mode. This is followed by a telco RJ12 connector for Host 3. The third connector (male 9 pin) is for connection to the Allen-Bradley PLC. The remaining two female 9 pin connectors are for Hosts 2 and 1 respectively. The Host 1 connection is also used for configuration.

All ports can be configured for communication type, baud rate, format, and error detect type.

The current default for all four ports is Full Duplex communication, 1200 baud, no parity, and CRC error detect.

2.2 Port Connector Pin Assignment

2.2.1 Computer Host 1, Configurator terminal (9 pin female DB9 connector)

Pin 2 RX data (input)
Pin 3 TX data (output)
Pin 4 DTR (output) Held high through 3 K. res. to 5 V.
Pin 5 Ground
Pin 7 RTS (output)

2.2.2 Computer Host 2 (9 pin female DB9 connector)

Pin 2 RX data (input)
Pin 3 TX data (output)
Pin 4 DTR (output) Held high through 3 K. res. to 5 V.
Pin 5 Ground

2.2.3 Allen-Bradley PLC (9 pin male DB9 connector)

Pin 2 RX data (input)
Pin 3 TX data (output)
Pin 4 DTR (output) Held high through 3 K. res. to 5 V.
Pin 5 Ground
Pin 7 RTS (output)

2.24 Computer Host 3 (6 pin Telco RJ-12)

Pin 1 Ground
Pin 2 DTR (output)
Pin 3 RX data (input)
Pin 4 TX data (output)

2.25 Power (female phono mini plug)

Tip 9 to 15 VDC
Ring Ground

3.0 Mode of Operation

The Allen-Bradley Interface Unit monitors host messages to determine the beginning of and end of requests. It assumes the start of a sequence when DLE STX characters are received in Full Duplex mode or DLE SOH or DLE ENQ characters are received in Half Duplex mode from a host. It assumes the end of a sequence when DLE ACK characters are received in Full or Half Duplex mode or DLE EOT characters are received from the PLC in Half Duplex mode.

When a sequence from a host begins, a safety timer is invoked. This timer sets the overall time a host can access the PLC. This default time-out value is set to 10000 milliseconds (10 seconds) and can be altered.

Because multiple hosts are accessing one PLC, the PLC should be configured with "Duplicate Detect:" disabled.

The unit will not accept unsolicited messages from the PLC.

4.0 Configuration

Parameters such as time-outs, protocol type, and baud rates may be altered in the unit via the Host 1 port and saved in battery backed up Random Access Memory (RAM). Any terminal or PC equipped with a terminal emulator package may be used to respond to the configuration dialog. The default configuration baud rate is 9600. The asynchronous format of the characters is 1 start, 8 data, and 1 stop bit. The configuration software handles X-ON/X-OFF flow control. A stand-alone DOS software program TERM.EXE supplied with the unit on 3-½ inch floppy disk will allow configuration from a PC with a serial communication port. In addition, the file PLC09.HT is supplied for use in configuring HyperTerminal. HyperTerminal is included without charge with Windows 95/98/NT. See TERM.TXT and PLC09.TXT on the supplied Terminal Emulator floppy disk for operating instructions with TERM.EXE and HyperTerminal respectively.

Pressing the pushbutton (for approximately 1 second) on the back of the unit until the Front Panel Led is extinguished will put the unit into configuration mode. At this time the message "PLC09 ALLEN-BRADLEY ARBITRATOR - 98-NOV-7 REV. 1.3 CONFIGURATION MODE - PRESS ENTER OR C TO PROCEED, CONTROL R TO RESET TO UNIT DEFAULT PARAMETERS, OR ESCAPE TO RETURN TO NORMAL OPERATION" is repeatedly sent out the Host 1 port. If the message is sent out ten times without a response, the unit will return to Normal Operation automatically. Once "ENTER" is input the configuration dialog begins.

The configuration method is of the question and answer type. The description of the configurable parameter and it's current value followed by a "?" is output. If the value is only to be viewed, pressing carriage return or "ENTER" will leave the value unaltered and display the next parameter or pressing "CONTROL B" will display the previous parameter. If the value is to be altered, the new value is typed, followed by "ENTER". Typing the “BACKSPACE” or “DELETE” keys can erase Erroneous input.

After configuration is complete or to abort the dialog at any time, the "ESCAPE" key should be pressed. The message "RETURNING TO NORMAL OPERATION!" will be output and the unit will begin operation with the new parameters.

If "CONTROL R" rather than "ENTER" is pressed, the message "RESTORE DEFAULT CONFIGURATION (Y,N)?" is asked. If "Y" followed by "ENTER" is entered, the unit will be made to reset all its parameters to default values.

4.0 COMMUNICATION - FULL DUPLEX (0), HALF DUPLEX (1)

This parameter selects the serial communication port protocol of the PLC. If Full Duplex is selected, DLE STX from a host starts a sequence and DLE ACK from a host ends a sequence. If Half Duplex is selected, DLE SOH or DLE ENQ from a host starts a sequence and DLE ACK from a host or DLE EOT from the PLC ends a sequence.

The current default is Full Duplex.

4.1 ERROR DETECT - CRC (0), BCC (1)

This parameter is required to tell the unit which method of error detection is in use.

The current default rate is CRC.

4.2 HOST 1 RATE

This parameter is used to set the baud rate from Host 1 to the unit. Values allowed are 110, 300, 600, 1200, 2400, 4800, 9600, and 19200 baud.

The current default rate is 1200 baud.

4.3 HOST 2 RATE

This parameter is used to set the baud rate from Host 2 to the unit. Values allowed are 110, 300, 600, 1200, 2400, 4800, 9600, and 19200 baud.

The current default rate is 1200 baud.

4.4 HOST 3 RATE

This parameter is used to set the baud rate from Host 2 to the unit. Values allowed are 110, 300, 600, 1200, 2400, 4800, 9600, and 19200 baud.

The current default rate is 1200 baud.

4.5 PLC RATE

This parameter is used to set the baud rate from the PLC to the unit. Values allowed are 110, 300, 600, 1200, 2400, 4800, 9600, and 19200 baud.

The current default rate is 1200 baud.

4.6 PLC FORMAT 8 DATA

The unit can communicate to the PLC with a format of 1 start, 8 data, even, or no parity, and 1 stop bit.

The current default is 0 (1 start, 8 data, no parity, and 1 stop bit).

4.7 HOST 1 FORMAT 8 DATA

Host 1 can communicate to the unit with a format of 1 start, 8 data, even, or no parity, and 1 stop bit.

The current default is 0 (1 start, 8 data, no parity, and 1 stop bit).

4.8 HOST 2 FORMAT 8 DATA

Host 2 can communicate to the unit with a format of 1 start, 8 data, even, or no parity, and 1 stop bit.

The current default is 0 (1 start, 8 data, no parity, and 1 stop bit).

4.9 HOST 3 FORMAT 8 DATA

Host 3 can communicate to the unit with a format of 1 start, 8 data, even, or no parity, and 1 stop bit.

The current default is 0 (1 start, 8 data, no parity, and 1 stop bit).

4.10 PLC PORT SAFETY T.O.

A safety timer is invoked to abort a request in case a response is not received from the PLC or excessive DLE NAKs are sent and a Host continues to hold the connection to the PLC. As a safety feature, when .78% of the T.O. is left, a DLE ACK is sent to the PLC. The time-out value is in milliseconds.

The current default time-out is 10000 milliseconds.

4.11 HOST 1 CONFIGURATION RATE

This parameter is used to set the default baud rate from Host 1 to a terminal or PC for configuring the unit. This is a completely separate parameter from the "HOST 1 RATE" in section 4.5. When the configuration pushbutton is pressed, this parameter selects the baud rate at which the unit will communicate. Values allowed are 110, 300, 600, 1200, 2400, 4800, 9600, and 19200 baud.

The current default rate is 9600 baud.

4.12 LED O/P

As a diagnostic aid, the front panel LED can be used for indicating when characters are being sent out one of the four ports. If characters are being sent, the LED will blink 10 times a second. It will continue to blink up to 1 second after a character is sent. Specifying “NONE” can disable this feature.

The default condition is 0 (PLC port output monitoring).

4.13 HOST 1 RTS CONTROL - OFF (0), ON (1)

This option allows RTS to be set high (modem carrier on) during output from the Arbitrator to Host 1. Option 4.14 sets the time from RTS going high until the first character of a PLC response is sent out the Host 1 port. This time can be used for 202 modem carrier stabilization before transmission occurs. If control is OFF, RTS is always asserted.

The default option is 0 (OFF).

4.14 RTS TO HOST 1 TX DELAY T.O.

This option is only available if option 4.13 is selected ON. This timeout specifies the time to begin sending characters to Host 1 after RTS is set high. RTS is set high when the first character of a response from the PLC is received and is not set low (modem carrier off) until all characters are sent out plus an additional time of 1.0 millisecond has elapsed. Timeout values from 1 to 2000 milliseconds may be specified.

The default timeout is 1 millisecond.

4.15 PLC RTS CONTROL - OFF (0), ON (1)

This option allows RTS to be set high (modem carrier on) during output from the Arbitrator to the PLC. Option 4.16 sets the time from RTS going high until the first character of a PLC response is sent out the PLC port. This time can be used for 202 modem carrier stabilization before transmission occurs. If control is OFF, RTS is always asserted.

The default option is 0 (OFF).

4.16 RTS TO PLC TX DELAY T.O.

This option is only available if option 4.15 is selected ON. This timeout specifies the time to begin sending characters to the PLC after RTS is set high. RTS is set high when the first character of a message for the PLC is received and is not set low (modem carrier off) until all characters are sent out plus an additional time of 1.0 millisecond has elapsed. Timeout values from 1 to 2000 milliseconds may be specified.

The default timeout is 1 millisecond.

4.17 HIGHEST VALID PLC NO.

The unit can be configured to wait for replies only from a selected range of PLC addresses in Half Duplex Mode. This option specifies the largest PLC address for which the Arbitrator can expect a response. The message is sent out the PLC port, but the unit does not wait for a reply.

The highest valid PLC address is 255. The default range of PLC addresses is from 0 (see section 4.18) to 255.

4.18 LOWEST VALID PLC NO.

The unit can be configured to wait for replies only from a selected range of PLC addresses in Half Duplex Mode. This option specifies the lowest PLC address for which the Arbitrator can expect a response.

The default lowest valid PLC address is 0. The default range of PLC addresses is from 0 to 255 (see section 4.17).

5.0 Hardware

The Allen-Bradley Interface Unit contains a HC68B09 Hitachi microprocessor, 8192 bytes of battery backed up RAM, 65536 bytes of EPROM (Erasable programmable read only memory), a status LED, and two 88C681 DUART (Dual universal asynchronous receiver/transmitter) used to communicate with the Hosts and PLC. Internal TTL to RS232C signal conditioning is provided by a RS232 and a RS237 interface ICs. Any D.C. voltage from 9 to 15 volts can power the standard unit. A calculator power supply rated at 9 volts D.C. and 500 m.a. is supplied. As an option, units can be supplied with 24 volts D.C. capability.

All ICs are CMOS type allowing the unit a wide variance in operating conditions. The unit's current drain is 70 m.a. when powered from 12 V. D.C..

6.0 Radio Frequency Information

PLC09 ARBITRATOR has been tested and found to comply with the limits of a Class A computing device in accordance with the specifications in part 15 of the FCC rules, which are designed to provide reasonable protection against RF interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or TV reception, the following measures may be attempted:

Reorient the antenna of the device detecting interference.
Relocate the device away from the PLC09 ARBITRATOR.
Use different branch outlets to power the device.

The booklet "HOW TO IDENTIFY AND RESOLVE RADIO-TV INTERFERENCE PROBLEMS" prepared by the FCC may also be helpful.

For any further assistance and suggestions for future enhancements concerning the PLC09 ARBITRATOR - ALLEN-BRADLEY INTERFACE please contact

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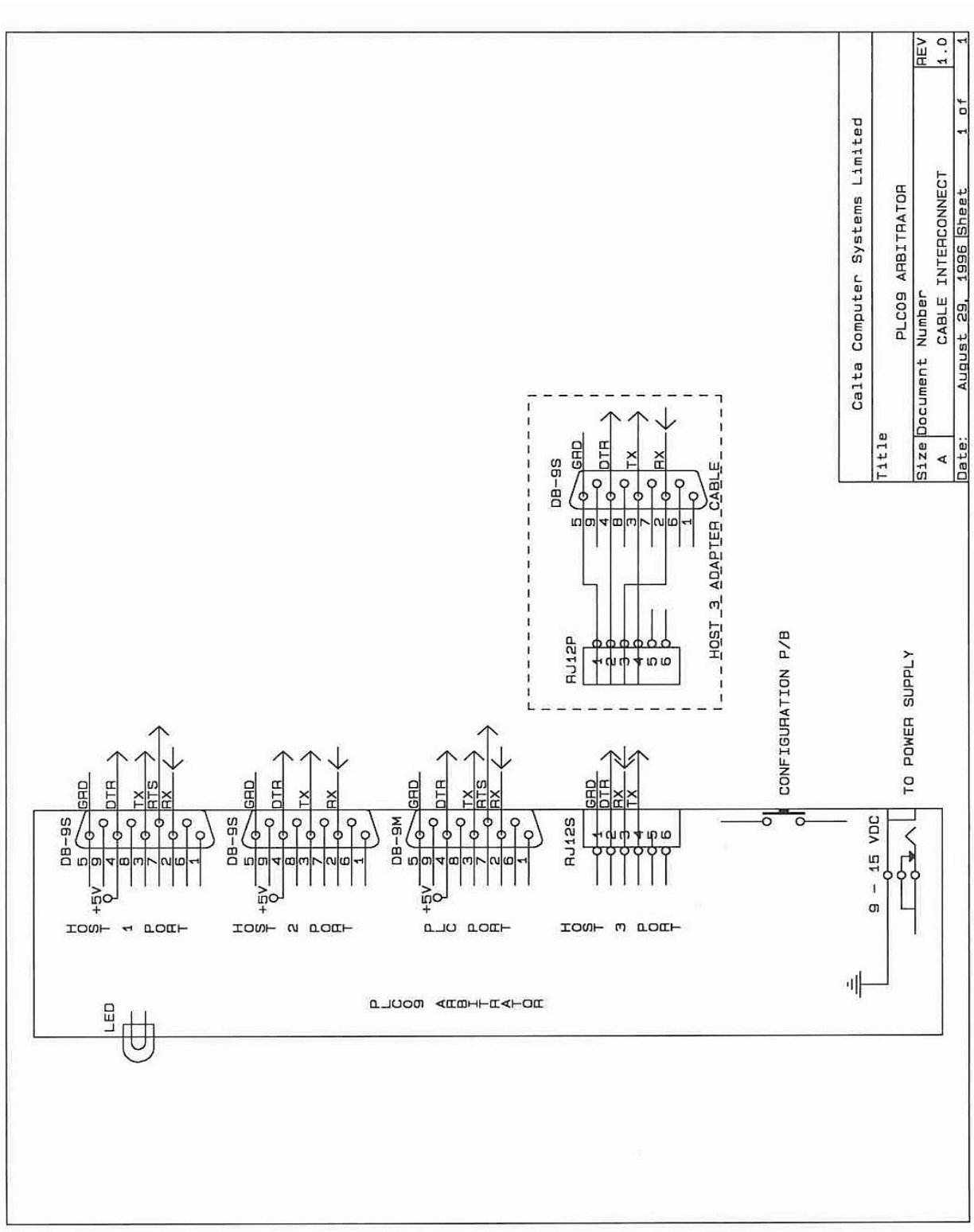
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